EXHIBIT

Dictionary

bar'ium ti'tanate

Chem.
a crystalline compound, $BaTiO_3$, used to make ferroelectric ceramics for capacitors and also used in transducers.

barium thiosulfate bar joist

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Barium titanate

From Wikipedia, the free encyclopedia

Barium Titanate	
Image:Barium titanate.jpg	
General	
Other names	
Molecular formula	$BaTiO_3$
Molar mass	233.192 g/mol
Appearance	white crystals
Crystal Structure	tetragonal
CAS number	[12047-27-7] [3] (http://webbook.nist.gov/cgi/cbook.cgi?ID=12047-27-7&Units=SI)
Properties	
Density and phase	6.02 g/cm^3, solid
Solubility in water	insoluble
Melting point	1625 °C
Boiling point	
Except where noted otherwise, data are given for materials in their standard state (at 25 °C, 100 kPa) Infobox disclaimer and references	

Barium titanate is an oxide of barium and titanium with the chemical formula $BaTiO_3$. It is a ferroelectric ceramic material, with a photorefractive effect and piezoelectric properties. It has four phases as a solid, listing from high temperature to low temperature: cubic, tetragonal, orthorhombic, and rhombohedral crystal structure. All of the structures exhibit the ferroelectric effect except cubic.

Contents

Appearance

It has the appearance of a white powder or transparent crystals. It is insoluble in water and soluble in concentrated sulfuric acid. Its risk and safety phrases are R20/22, Template:S28A, S37, and S45.

Manufacture

Barium titanate can be manufactured by sintering of barium carbonate and titanium dioxide, optionally with other materials for doping.

Barium titanate is often mixed with strontium titanate.

Uses

Barium titanate is used as a dielectric material for ceramic capacitors, and as a piezoelectric material for microphones and other transducers. As a piezoelectric material, it was largely replaced by lead zirconate titanate, also known as PZT.

Polycrystalline barium titanate displays positive temperature coefficient, making it an useful material for thermistors and self-regulating electric heating systems.

Fully-dense nanocrystalline barium titanate has 40% higher permittivity than the same material prepared in classic ways.[1]

Barium titanate crystals find use in nonlinear optics. The material has high beam-coupling gain, and can be operated at visible and near-infrared wavelengths. It has the highest reflectivity of the materials used for self-pumped phase conjugation (SPPC) applications. It can be used for continouos-wave four-wave mixing with milliwatt-range optical power. For photorefractive applications, barium titanate can be doped by various other elements, eg. cerium.[2]

Thin films of barium titanate display electrooptic modulation to frequencies over 40 GHz.[3]

See also

- Strontium titanate
- Lead zirconate titanate

References

1. ^ http://research.ucdavis.edu/ncd.cfm?caseno=2003-010 [1] (http://research.ucdavis.edu/ncd.cfm?caseno=2003-010)
2. ^ http://www.redoptronics.com/Ce:$BaTiO_3$-crystal.html Ce:$BaTiO_3$ (http://www.redoptronics.com/Ce-Batio3-crystal.html)
3. ^ http://www.opticsexpress.org/abstract.cfm?URI=OPEX-12-24-5962 [2] (http://www.opticsexpress.org/abstract.cfm?URI=OPEX-12-24-5962)

External links

- Link page to external chemical sources.

Categories: Titanates | Barium compounds | Ceramic materials | Piezoelectric materials | Inorganic compound stubs